IN THE SPECIFICATION:

Please amend paragraph **[0002]** as follows:

[0002] State of the Art: Seals are conventionally used in maintaining a substance, such as a fluid or gas, located in one area or zone from communicating with another area or zone while allowing relative movement between two or more mechanical components. Typically, one of the mechanical components may traverse through both of the areas or zones. Such seals may also be used in keeping contaminants, such as dirt, dust, or other particulate-type materials, from becoming positioned in an area where one mechanical component moves relative to the surface of another mechanical component. Otherwise, repeated movement between the mechanical components, in combination with the presence of contaminants, may cause damage to the surfaces of the one or more mechanical components as well as to sealing elements.

Please amend paragraph **[0008]** as follows:

[0008] Accordingly, a sleeve element of the present invention may provide a fluid seal and a bearing surface between two relatively ~~moveable~~ movable machine parts. The sleeve element preferably comprises a substantially continuous annulus comprising a relatively rigid, resilient material. For example, a sleeve element of the present invention may be formed from a material that exhibits about 2% or more resilient elongation including polyamide, polytetrafluoroethelene (PTFE), acetal, polyethelene, polyurethane, or other materials.

Please amend paragraph **[0041]** as follows:

[0041] FIG. 5B shows a cross-sectional view of an apparatus including a bore disposed about the seal element and a piston element disposed within the seal element as shown in FIG. 5A;

Please amend paragraph **[0050]** as follows:

[0050] Therefore, sleeve element 22 and 24 may be formed of a material that elongates, to some extent, without substantial damage. For example, a material that reversibly elongates about 2% or more may allow sufficient flexibility or resiliency such that sleeve elements 22

and 24 may be positioned about the upper end 36 and lower end 38 of piston element 20, respectively, and between retention flanges 42 and 43 and 44 and 45, respectively. Reasoning further, considering the above example, the diameters of outer surfaces 27, retention flanges 43 and 45, or a combination thereof may be at least about 2% larger than the diameters of corresponding inner surfaces 31 of sleeve element 22 and 24. As generalized from the example, each outer surface 27 as well as retention flanges 43 and 45 of piston element 20 may be larger in diameter than the diameter of the corresponding inner ~~surface~~ surface 31 of sleeve element 22 or 24 by up to about the amount of resilient elongation that the material forming sleeve elements 22 and 24 may accommodate without incurring substantial damage.

Please amend paragraph **[0053]** as follows:

[0053] In another aspect of the present invention shown in FIG. 1C, sleeve element 22 may include a sealing feature 32 that extends laterally beyond bearing surface 40 of sleeve element 22, as shown in relation to reference line 41. Put another way, the lateral thickness of sleeve element 22 and protrusion thereof beyond bearing surface 40 may increase within the upper end region 21. Generally, the sealing feature 32 may be configured to matingly engage and seal against a bore surface 50 (FIGS. 1D and 1E). Although sealing feature 32 is shown in FIGS. 1A-1E generally as an annular feature having a pointed or sharpened tip facing laterally outwardly, the configuration of the sealing feature 32 may depend on the material that is used to form sleeve element 22, as well as the size and configuration of the components of the seal assembly 10. Therefore, the sealing feature 32 may exhibit different geometries. For instance, the sealing feature 32 may be rounded, and may include more than one protruding structure, such as, for instance, alternating sharpened and rounded protrusions. In general, the sealing feature 32 may be configured to sealingly engage a bore surface 50 (FIGS. 1D and 1E) within which the seal assembly 10 is disposed. Accordingly, the shape, size, and configuration of the sealing feature 32 may depend on the contact stresses and the expected or predicted deformation of the sleeve element 22 in relation to a bore wall or bore surface 50 (FIGS. 1D and 1E).

Please amend paragraph **[0059]** as follows:

[0059] As another advantage of the apparatus 11 as depicted by FIGS. 1D and 1E, the inward biasing of the upper end region 21 of sleeve element 22 and lower end region 23 of sleeve element 24 may cause an increase in the contact stress between at least a portion of the bearing surface 40 and the bore surface 50. For instance, the biasing of upper end region 21 of sleeve element 22 into recess 26 may generate a slight deformation in the bearing surface 40 of sleeve element 22. Such a configuration may reduce clearances between bore surface 50 and sleeve ~~element~~ elements 22 and 24, which may provide for improved positioning of the piston element 20 within bore surface 50.

Please amend paragraph **[0061]** as follows:

[0061] However, apparatus 51 also includes energizer 60 disposed generally within recess 66 as well as energizer 62 disposed generally within recess 68. Energizers 60 and 62 may be formed as an annular member, such as an O-ring. Therefore, ~~recess~~ recesses 66 and 68 may be sized and configured to position energizers 60 and 62 against sleeve elements 22 and 24 and also retain energizers 60 and 62 during use. Energizers 60 and 62 may be formed of any of various materials including thermoset or thermoplastic. For example, preferably, thermoset or thermoplastic elastomers may be used, such as, for instance, polyurethane, nitrile rubber (NBR), neoprene, ~~Viton®,~~ VITON®, silicone, or other suitable resilient materials may be used to form energizer 60, energizer 62, or both.

Please amend paragraph **[0064]** as follows:

[0064] FIG. 1H shows an enlarged partial cross-sectional view of the ~~apparatus~~ apparatus 51 shown in FIG. 1F. As shown in FIG. 1H, upon positioning of bore surface 50 about sleeve element 22, contact between bore surface 50 and sealing feature 32 may cause the upper end region 21 of sleeve element 22 to compress energizer 60. In addition, sealing feature 32 may sealingly engage bore surface 50, biasing the upper end region 21 of sleeve element 22 laterally inwardly within recess 66 as shown in FIG. 1G. Of course, the amount of lateral overlap between the upper end region 21 of sleeve element 22, denoted by $\delta 1$, may increase according to

the bias of upper end region 21 laterally into recess 66. Of course, energizer 60 may resiliently support biasing of upper end region 21 of sleeve element 22 into recess 66. As may also be seen in reference to FIG. 1H, biasing upper end region 21 of sleeve element 22 into recess 66 may also preferentially retain or position energizer 60 against the lower end of recess 66. More specifically, the upper end region 21 of sleeve element 22 may be configured to preferentially position energizer 60 generally within the lower axial region of recess 66. Such a configuration may provide a relatively robust sealing arrangement and may resiliently support the upper end region 21 of sleeve element 22 within recess 66.

Please amend paragraph **[0065]** as follows:

[0065] As discussed above, energizers may provide an improved seal against fluid or gas moving therearound, which seal may be useful in inhibiting penetration of fluid or gas between the piston element 20 and sleeve elements 22 and 24. However, the presence of energizers 60 and 62 may also prevent the release of pressurized fluid or gas that may become disposed between piston element 20 and sleeve element 22, sleeve element 24, or both. Such pressurized fluid or gas, if retained between the piston element 20 and the inner surface 31 of sleeve element 22 or 24 by corresponding energizer 60 or 62, may cause sleeve elements 22 or 24 to be damaged. More specifically, damage may occur to sleeve element 22, sleeve element 24, or both when the pressure acting on the inner surface 31 of sleeve element 22, sleeve element 24, or both is higher than the pressure acting on the corresponding bearing surface 40 of sleeve ~~elements~~ element 22, sleeve element 24, or both.

Please amend paragraph **[0066]** as follows:

[0066] Therefore, in another aspect of the present invention, a pressure relieving structure may be included in combination with an energizer, the pressure relieving structure configured to release pressurized gas or fluid that exists between the inner surface 31 of either of sleeve element 22 or 24 and the outer surface 27 of piston element 20. In one embodiment, a vent feature 70 may be formed within the upper end region 21 of sleeve element 22. More particularly, as shown in FIG. 1I and 1J, vent feature 70 may extend along the surface of the

sleeve element 22 adjacent to the energizer 60 so that a change in position of the ~~energizer~~ energizer 60 selectively allows or inhibits flow therearound. Vent feature 70 may be a broached indentation or channel along the inner ~~surface~~ surface 31 of the sleeve element 22. The vent feature 70 may be positioned so that when the energizer 60 contacts the sleeve element 22 below a selected position, flow around or about the energizer 60 is substantially prevented or inhibited. However, when energizer 60 contacts sleeve element 22 above the selected position, flow around or about energizer 60 is allowed.

Please amend paragraph **[0067]** as follows:

[0067] For instance, during operation, a pressure difference across the ~~energizer~~ energizer 60 in different directions may cause the energizer 60 to be positioned differently within recess 66. For instance, when the pressure acting above the contact point 75 between energizer 60 and sleeve element 22 is higher than the pressure acting therebelow, energizer 60 may be forced downward and therefore positioned along the axial lower portion of recess 66, as depicted in FIG. 1I. In this position, energizer 60 may effectively seal against fluid or gas passing thereacross. Conversely, where the pressure acting below contact point 75 between energizer 60 and sleeve element 22 is greater than the pressure acting on the energizer 60 above the contact point 75, the energizer 60 may be forced upwardly within recess 66, as shown in FIG. 1J. As shown in FIG. 1J, fluid or gas within the lower portion of recess 66 may pass by energizer 60 upwardly through vent feature 70, thus reducing the pressure between the inner surface 31 of sleeve element 22 and the outer surface 27 of piston element 20. As discussed above, although the vent feature 70 is described in relation to sleeve element 22, sleeve element 24 may also include a pressure relief structure such as the vent feature 70 described above.

Please amend paragraph **[0068]** as follows:

[0068] Further, as disclosed in U.S. Patent No. 6,595,524 to Zitting, assigned to the assignee of the present invention, and incorporated in its entirety by reference, a portion of an energizer may be configured to allow preferential flow therearound. As shown in FIGS. 1K-1M,

energizers 80 and 86 may include stand-off protrusions, grooves, or both that may selectively allow fluid or gas to flow or pass therearound. Specifically, as shown in FIGS. 1K and 1L, energizer 80 may include circumferentially spaced axial protrusions 84 as well as circumferentially spaced lateral protrusions 82. Thus, when energizer 80 is positioned generally within recess 66 as shown in FIG. 1K, energizer 80 may seal against a fluid or gas passing thereby. However if the pressure between inner surface 31 of sleeve element 22 and piston element 20 increases over the pressure axially above energizer 80, energizer 80 may be moved longitudinally upwardly. Thus, once energizer 80 no longer contacts the lower axial surface of recess 66, fluid or gas may pass therearound, by way of the flow path between the wall of the ~~recess~~ recess 66 and the surface of energizer 80, portions of which are spaced away from the wall of the recess 66 by way of axial protrusions 84 and lateral protrusions 82. Similarly, as shown in FIGS. 1M and 1N, energizer 86 may seal against the lower axial surface of recess 66 if pressure acting on the upper surface of energizer 86 exceeds the pressure acting on the lower surface thereof. However, if pressure acting on the lower surface of energizer 86 exceeds the pressure acting on the upper surface thereof, energizer 86 may be moved within recess 66, allowing the fluid or gas at a higher pressure to move by the energizer 86, via axial channels 88 and lateral channels 90, to equalize the pressure across energizer 86.

Please amend paragraph **[0070]** as follows:

[0070] In addition, the present invention contemplates another mechanism for inhibiting damage to either of sleeve elements 22 and 24 due to an increased pressure acting on the inner surfaces 31 ~~thereof~~ thereof, in relation to the pressure acting on the bearing surfaces 40 thereof, respectively. Particularly, as shown in FIG. 1P, the pressure acting on the inner surface(s) 31 of sleeve elements 22 and 24 may be substantially equalized in relation to the pressure acting on the bearing surface(s) 40 thereof, respectively. Aperture(s) 92 may extend between the inner surface 31 of either sleeve elements 22 or 24 to the bearing surface 40 thereof, respectively, so that pressure may communicate therebetween. In such a configuration, pressure differences may be inhibited, since the pressure acting on the inner surface 31 of the sleeve element 22 and the pressure acting on the bearing surface 40 thereof may substantially equalize.

Although aperture(s) 92 are shown as positioned in the upper end region 21 of sleeve element 22, apertures may be disposed along sleeve element 22 without limitation, and may take any number of geometries, such as round holes, axial slots, circumferential slots, or may be otherwise configured to allow pressurized fluid or gas to communicate between inner surface 31 of sleeve elements 22 or 24 with its corresponding bearing surface 40 thereof.

Please amend paragraph **[0075]** as follows:

[0075] Generally, the behavior of upper end region 121 and lower end region 123 as disposed laterally adjacent to recesses 126 and 128, respectively, may be analogous to the behavior as described above in relation to upper end region 21 of sleeve element 22 and lower end region 23 of sleeve element 24. Accordingly, as shown in FIG. 2B, sealing features 132 of sleeve element 122 may sealingly engage bore surface 50 disposed therearound, and upper end region 121 as well as lower end region 123 (see FIG. 2A) may be biased into laterally adjacent recesses 126 and 128, respectively. In addition, sleeve element 122 includes bearing surface 140 for conformally engaging bore surface 50. Such a configuration may provide relatively efficient and effective sealing and bearing structure for use in machine components that move relative to one another.

Please amend paragraph **[0077]** as follows:

[0077] Turning to FIG. 3A, which depicts another exemplary embodiment of a seal assembly 210 of the present invention, it may be desirable to position an energizer 260 generally within recess 261 formed in piston element 220. Such a configuration may provide resilient support and bias to the sleeve element 122 in relation to a bore surface 50 (FIG. 3B). Therefore, energizer 260 may be formed of a material that exhibits reversible deformation or resiliency. Such materials may include, for instance, thermosets or thermoplastics. More particularly, thermoset or thermoplastic elastomers may be used, such as, for example, polyurethane, nitrile rubber (NBR), neoprene, ~~Viton®,~~ VITON®, silicone, or other suitable resilient materials may be used to form energizer 260.

Please amend paragraph **[0078]** as follows:

[0078] Analogous to the description of seal assembly 110, seal assembly 210 includes piston element 220 comprising a generally annular body disposed about axis 212 and may include recesses 214 and 216 formed therein. Also, piston element 220 may include upper end region 236 and lower end region 238, which are shown as being rounded to facilitate positioning of sleeve element 122 about piston element 220. In addition, sleeve element 122 may be positioned about piston element 220, and may be sized so that the diameter of inner surface 131 thereof is smaller than the diameter of outer surface 227 of piston element 220. Further, as shown in FIG. 3A, sleeve element 122 may be disposed about piston element 220 between retention flanges 143 and 145, the lateral extent of which may exceed the lateral position of inner surface 131 of sleeve element 122, to mechanically constrain sleeve element 122 therebetween. Sleeve element 122 may include sealing features 132, configured to sealingly engage a bore surface 50 (shown in FIG. 3B), depressions 146, as described hereinabove, as well as bearing surface 140, configured to conformally engage bore surface 50 (shown in ~~FIG. 2B).~~ FIG. 3B). Sleeve element 122 may also include an upper end region 121 positioned laterally adjacent to recess 126 and a lower end region 123 positioned laterally adjacent to recess ~~228.~~ 128 (FIG. 3B).

Please amend paragraph **[0079]** as follows:

[0079] As set forth above, bending of the upper end region 121 and lower end region 123 may be analogous to the behavior as described above in relation to upper end region 21 of sleeve element 22 and lower end region 23 of sleeve element 24. Accordingly, as shown in FIG. 3B, sealing features 132 of sleeve element 122 may sealingly engage bore surface 50 disposed therearound, and upper end region 121 as well as lower end region 123 (see FIG. 3A) may be biased into corresponding laterally adjacent recesses 126 and 128. In addition, bearing surface 140 of sleeve element 122 may conformally engage bore surface 50. However, the position, size, and configuration of energizer 260 may be adjusted. For instance, energizer 260 may be positioned, sized, and configured to provide a selected support characteristic to the sleeve element 122. More particularly, the resiliency of energizer 260 may be tailored to bias the sleeve element 122 laterally outwardly toward the bore surface 50. Of

course, more than one energizer may be used to bias sleeve element 122. Further, the shape of the sleeve element 122 as disposed within bore surface 50 may be tailored by way of configuring one or more energizer.

Please amend paragraph **[0083]** as follows:

[0083] Bending of the upper end region 121 and lower end region 123 may be comparable to the behavior as described above in relation to upper end region 21 of sleeve element 22 and lower end region 23 of sleeve element 24. Accordingly, as shown in FIG. 4B, sealing features 132 of sleeve element 122 may sealingly engage bore surface 50 disposed therearound, and upper end region 121 as well as lower end region 123 <u>(see FIG. 4A)</u> may be respectively biased into corresponding laterally adjacent recesses 326 and 328. Accordingly, the upper end region 121 and lower end region 123 of sleeve element 122 may laterally overlap corresponding retention flanges 343 and 345.

Please amend paragraph **[0084]** as follows:

[0084] Further, seal assembly 310 may include features as described above with reference to FIGS. 1I-1P. For instance, seal assembly 310 may include a pressure relief feature or a pressure equalization feature. A pressure relief feature may allow for pressure between the inner surface 131 of sleeve element 122 and the outer surface 327 of piston element 320 in excess of the pressure that is applied to the axial upper surface of an energizer to be reduced or relieved. Any of the pressure equalization features described above may be employed. For instance, apertures <u>94 (FIG. 1P)</u> that extend between the inner surface 131 of sleeve element 122 and the bearing surface 140 of sleeve element 122 may allow for pressure acting on each surface to be substantially equalized. Such a configuration may prevent damage to sleeve element 122 due to pressure acting on the inner surface 131 of sleeve element 122 that exceeds pressure acting on the bearing surface 140 thereof, respectively.

Please amend paragraph **[0090]** as follows:

[0090] Further, apparatus 411 may include features as described above with reference to FIGS. 1I-1P. For instance, apparatus 411 may include a pressure relief feature or a pressure equalization feature. A pressure relief feature may allow for pressure between the outer surface 431 of sleeve element 422 and the bore surface 450 in excess of the pressure that is applied to the axial upper surface of an energizer to be reduced or relieved. Any of the pressure equalization features described above may be employed. For instance, apertures 92 (FIG. 1P) that extend between the outer surface 431 of sleeve element 422 and the bearing surface 440 of sleeve element 422 may allow for pressure acting on each surface to be substantially equalized. Such a configuration may prevent damage to sleeve element 422 due to pressure acting on the outer surface 431 of sleeve element 422 that exceeds pressure acting on the bearing surface 440 thereof, respectively.

Please amend paragraph **[0094]** as follows:

[0094] Further, apparatus 511 may include features as described above with reference to FIGS. 1I-1P. For instance, apparatus 511 may include a pressure relief feature or a pressure equalization feature. A pressure relief feature may allow for pressure between the outer surface 531 of sleeve element 522 and the bore surface 550 in excess of the pressure that is applied to the axial upper surface of an energizer to be reduced or relieved. Any of the pressure equalization features described above may be employed. For instance, apertures 92 (FIG. 1P) that extend between the outer surface 531 of sleeve element 522 and the bearing surface 540 of sleeve element 522 may allow for pressure acting on each surface to be substantially equalized. Such a configuration may prevent damage to sleeve element 522 due to pressure acting on the outer surface 531 of sleeve element 522 that exceeds pressure acting on the bearing surface 540 thereof, respectively.